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UNITED STATES DEPARTMENT OF AGRICULTURE

FOREST SERVICE

BRANCH OF RESEARCH

MONTHLY REPORT

OF

FOREST EXPERIMENT STATIONS

FOREST PRODUCTS

FOREST ECONOMICS

RANGE RESEARCH

NOV 1928



BRANCH OF RESEARCH

November, 1928

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FOREST EXPERIMENT STATIONS

Washington

General

The classification of the field personnel was about finished at the end of November and was completed in the early part of December. Department approval has been obtained for the greater part of the Forest Service recommendations for field classification.

Legislation

Congress met on the third of December, and the status of the Agricultural Bill is of interest. The bill was introduced on December 14 and carries with it an increase in the item for the experiment stations of \$29,593 for the Lake States and \$6,000 for naval stores investigations at the Southern Station. Forty thousand dollars is provided for the timber survey work in the Pacific Northwest, and \$25,000 for economic investigations into the cost and returns of growing timber; \$14,320 is provided under range investigations for the work in the Intermountain region, and \$32,000 is provided for the Forest Products Laboratory. The only other bureau apparently to receive an increase under the McSweeney-McNary Act is the Biological Survey, which obtained approximately \$8,000.

Stimulation of Cuttings

Coville has initiated a study of the stimulation of the rooting of yellow poplar cuttings. In this work several combinations of conditions will be tried. Both tip cuttings and the next cut back of the tip will be tried. Some of the cuttings will be given various temperature treatments before, during, and after storage as well as treatment with chemicals and gas. Other cuttings will be mechanically injured. Storage will be made in bank sand, peat, a mixture of half peat and half sand, and in seven kinds of sawdust. The study has for its purpose the determination of some method which would be applicable to the vegetative propagation of desirable strains of any species.

Tree Name Committee

The Forester has announced the new Committee on Tree Names. This consists of Ward Shepard, Chairman, Perkins Coville, W. A. Dayton, and W. W. Ashe.

(Over)

Mississippi Flood

Data still continues to come in from the stations regarding the various items pertaining to the effect of forests on streamflow and erosion and progress has been made toward the compilation for the publication of the report.

Mensuration

The Section of Forest Measurements has been following actively the oak yield study and is working on the volume table phase of some of the associated species. Other work included the preparation of the Scribner volume tables for the southern pine manuscript, these tables now being on their way to the printer. Regular work was interrupted by the need of compiling classification data, etc.

Equipment and Supplies

Two "finds" have recently been made which may help the stations a great deal in Station work. The first is Higgins' Eternal black-writing ink. This is a waterproof black ink, similar to the regular Indian drafting ink, but thinner-bodied so that it can be used in fountain pens. It is ideal for making permanent records, since it is waterproof, will not fade, and its use in a fountain pen saves time. Points plotted on graph paper with this ink naturally show up much better than pencil or ordinary blue-black ink, and it is possible to use it in the field. The second "find" is the Wrico lettering guide set (handled by Dietzgen), consisting of lettering guides and special pens. Letters (and numbers) of various sizes from 1/16-inch up, in vertical or slant type, can be made. Very fine work can be done rapidly with this equipment, even by inexperienced draftsmen. The equipment is relatively inexpensive.

Stations in need of form 562-A will be interested in knowing that the G.P.O. has promised delivery on December 19.

Library

There were 874 loans of books and periodicals from the library in November, and 139 members of the Service and others consulted the library in person.

The number of books and periodical articles indexed for the catalogue during the month was 191.

NORTHEASTERN FOREST EXPERIMENT STATION

Westveld attended the annual forest management meeting held by the officers of the White Mountain National Forest during the last week in November. The primary purpose of the field meet this year was to impress on the ranger force the importance of weeding as a silvicultural measure for improving the composition of incoming stands on cut-over areas. A number of different cut-over areas were visited in the course of the meeting. A wide variety of reproduction conditions were encountered, and discussed with respect to their adaptability to weeding operations. By sizing up one situation after another the group was soon able to recognize the need or futility of practising weeding in the various areas visited.

An examination was also made of the set of weeding plots established by Westveld in nine-year-old cuttings supporting a growth of spruce and fir and hardwoods. The purpose of this experiment was to determine the feasibility of converting a young mixed hardwood and softwood stand to a pure stand of pulpwood species through weeding of merchantable and unmerchantable hardwoods. Three plots, each $\frac{1}{4}$ -acre in size, comprise the experiment. On one plot 50 cents was expended for weeding; on one adjacent to it, \$1.00, while the third plot was held as a check. The following table shows the extent to which the conifers on the two plots were released through weeding:

Number of stems weeded and number of conifers released
on two quarter-acre plots, subjected to different
degrees of intensity of weeding

Plot No.	Weeding cost	Number of stems cut			Number of conifers released
		Merchantable hardwoods	Weed species	Total	
II	\$1.00	845	401	1,246	462
III	.50	436	170	606	279

Since the plots were established only last fall no figures, of course, are yet available on the effect of weeding on the height growth of the released conifers.

With the closing down of the Petersham station (maintained in cooperation with the Harvard Forest), field work on the fire weather study ended for the year. After waiting vainly for four years for a real fire year, we can sympathize with the "bad luck" Mitchell reported in the October report. With the exception of brief periods of danger each year in the white pine region, we have had no fire year since 1924; in fact, most State foresters in the northeast claim that the way to eliminate fire danger is to start fire weather studies.

Stickel, with the aid of Barrows, remeasured the chestnut replacement plots (M-3) mentioned in the last report. The pines on the plot on which the hardwood sprouts have been kept back are considerably taller and have a much better appearance than those on the unweeded plot.

CENTRAL STATES FOREST EXPERIMENT STATION

General

Field work has been carried on by members of the Station staff entirely through November. Munns came to the Station early in the month, made one inspection trip into southern Ohio with McCarthy and another into Indiana with Kellogg.

Working Centers

The Ozark National Forest is the only one in the territory of this Station. An examination of the central and eastern divisions of this forest was made late in November by McCarthy accompanied by L. S. Gross. Supervisor Koen and several members of his staff assisted in this examination. McCarthy reports good progress in fire and road work on this forest. In fact, the forest is very accessible and areas burned during the past year are very hard to find.

The following observations in regard to this forest are sufficiently outstanding to justify recording:

The Ozark Forest is largely composed of good tree species including shortleaf pine, white oak, northern red oak, southern red oak, eastern red cedar, walnut and red gum. Thickets of undergrowth, such as laurel, were not seen. The percentage of timber productive acreage is very high. There is no non-merchantable (short) timber type due to drought or elevation. The tree species all appear to be free from pronounced spiral grain. Hardwood species persist as sprouts when killed back to the ground by fire. Protection from fire alone will result in a well stocked forest. The Sylamore Ranger District, located on the overlapping margins of several geological formations, has a good representation of forest types common to the other divisions of the forest and will probably be the most logical center for experimental work.

Plantations

No field work on this project was done during the month, since the time of the staff is being spent on securing stem data for oak volume tables. However, Munns and Kellogg went into Indiana and visited several of the plantations in which plots were established earlier in the season. Plantations of walnut, one in which chestnut is being succeeded by sugar and black maples, one in which hardy catalpa is likewise being replaced by the maples, and plots of yellow poplar, sycamore, white ash and black locust in Jackson County were visited. Munns was favorably impressed by the development shown by some of these plantations. Of special merit is the Elwell walnut lot in which nuts were widely planted by the "heel method," hit or miss, in a cattle pasture about 60 years ago. Walnut has been sold four times from this area, about \$3,000 worth having been cut during the war times and at war prices. Several woodlots in the Knobs region were visited before the Clark County State Forest was reached. The State Nursery and a cutting which is being made were visited, and a portion of the forest was traversed to get a better idea of the composition and character of this forest as a possible working center for the station.

Oak Study

On November 13 Coile and Kellogg revisited the right-of-way which the A.T. and T. Company is clearing north of Cambridge, Ohio, and secured additional measurements on black cherry, slippery elm, chestnut and a few minor species.

Thirteen plots were found in the vicinity of Ann Arbor, Hastings and Greenville. These plots were very well stocked and none of them severely damaged by either fire or grazing. They were the result of clear cutting for cordwood. In contrast to these stands were those at Higgins Lake, where the original forest had consisted principally of white pine in mixture with oak, aspen and white birch. The pine had been cut and the subsequent stand consisted principally of these associated species but had not developed under normal fully stocked conditions. This made it impossible to find areas which were suitable for yield studies.

Water Absorption by Litter

Day, assisted by Coile, completed a number of tests on the accumulation and moisture absorptive capacity of leaf litter for the beech-maple and the oak-hickory types characteristic of the central hardwood region. Ten milacre plots were laid out in each type. The litter collected from each plot was weighed, and samples

were taken for moisture content and absorptive capacity determinations. In determining the absorptive capacity, the litter after saturation was allowed to drain with as little disturbance as possible, so as to retain as far as possible the capillary and hygroscopic water and also the water retained by the mechanical arrangement or cupping effect of the leaves. All the water held against gravity was considered a part of the absorptive capacity of the litter. A brief summary of the results of these tests is tabulated below.

Type	: Oven dry : weight : per acre : Pounds :	absorptive : capacity in : % of oven : dry weight :	Water-retaining capacity : per acre based on oven : dry condition : Pounds : Equivalent Rainfall : Inches :
Beech-maple	8,020	376.5	30,196 0.1333
Oak-hickory	6,525	346.0	22,570 0.0997

A second measurement of the beech-maple plots after the 1928 leaf fall showed that 4646 pounds of litter per acre, oven dry weight, had been added to the total accumulation. The 1928 leaf fall was not yet complete (November 10) in the oak-hickory type.

In connection with this study the 50 plots taken by Meyer in the grazing reconnaissance were checked over to obtain an idea of the average accumulation of litter under grazed and ungrazed conditions. Twenty-four beech-maple-tulip plots, twelve grazed and twelve ungrazed, were found to have an average accumulation of 0.8 and 1.6 inches respectively. The oak-hickory type did not show so pronounced a difference, eighteen grazed plots averaged 1.25 inches, while eight ungrazed plots averaged 1.75 inches.

Meyer's comments on the distribution of the litter showed that it was good in all cases under the ungrazed beech-maple-tulip type and that it was erratic on only two plots in the ungrazed oak-hickory type. On the other hand, the grazed plots showed only two instances in each type which had a normal distribution of litter.

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LAKE STATES FOREST EXPERIMENT STATION

The Station is now in winter quarters.

The Upper Peninsula branch station near Ruse was closed for the season on November 22. Logging of 20 acres of the experimental forest was begun this year early in September, and therefore practically all logging operations could be completed before the Station was closed. Thirty-five thousand board feet of logs were put up on the skids, and a large number, not yet exactly determined, of cords of chemical wood was cut and piled. The brush on a strip along the highway was piled and burned, and on the rest of the area lopped and scattered.

A study of the progress of the deterioration of piled slash was initiated in connection with the logging operations. Ten piles of slash are under observation. Their heights are to be measured every year and the condition of the wood noted.

Small quantities of sugar maple, yellow birch, and northern white cedar seed, collected locally, were planted in seed beds. A count of 200 white pine seedlings, planted under aspen on one-half acre on May 25, showed only 166 seedlings living by November 10. This loss includes seedlings that were pulled up or bitten off by deer and rabbits, as well as that brought about by direct natural causes.

Brushing out of the entire two-mile fire line around the cut-over half section of the experiment station area was completed. Stumps were removed and slash burned at the east and west boundaries and all but about five-eighths of a mile on the north boundary.

Practically 80 per cent of all the work at the Station during the month was confined to working up results of our Wisconsin studies carried on in cooperation with the University of Wisconsin. These include the effect of drainage ditches upon timber growth, the relation of weather to fire hazard, growth of hardwoods after selective logging, and recently there has been added the preparation of a pamphlet on the economic importance of the woodlot in the State. The latter is being prepared by Fred Wilson, Extension Forester of the University of Wisconsin, who is our guest this month. The reason for concentrating upon the Wisconsin studies is that it is the desire of the University to have all the reports printed and distributed during the legislative session.

Mitchell, in the study of the relation of weather to fire hazard, determined as a side issue the yearly accumulation of leaf fall

in the hardwood-hemlock type. He found that it amounts to 2525 pounds of dry leaves per acre. The composition of these fallen leaves is of interest. Sugar maple constituted 80 per cent by weight; other hardwoods, such as yellow birch and elm, 19 per cent; and hemlock 1 per cent. On the average a square foot of ground received 175 maple leaves, 45 leaves of other hardwoods, 20 maple seeds, and 2 basswood fruits. The hemlock needles and seeds were not determined. Mitchell found that the surface hardwood leaf litter becomes inflammable when its moisture content falls below 40 per cent. This may happen during the first clear day after a rain. When the moisture content of the leaf litter falls below 20 per cent, ground fires spread rapidly.

Bates completed the extraction of Norway pine seed from about 40 different sources and begun the determination of their comparative germinability. Ten additional sources of Norway pine seed were added during the month. Study of the effect of different methods of seed storage of white pine was also begun, as well as of the effect of pre-treatment of seed.

Four new technical notes were issued during the month, as follows:

- No. 5. Climatic Seed Sources for Norway Pine.
- No. 6. Growth of Northern Hardwoods after Partial Cutting.
- No. 7. The Forest Seed Crop of 1928.
- No. 8. Amount of Solid Wood per Cord of Sticks of Different Diameters.

These notes were distributed to our selected mailing list of about 1200. The reaction to them was favorable. The Station received requests for these notes from the South, the Pacific Coast, and Canada.

The Woodsmen's Short Course, given again this year by the College of Agriculture of the University of Wisconsin, in cooperation with our Station, brought "students" not only from Wisconsin but also from Minnesota and Michigan. The emphasis last year was on selective logging; this year commercial planting was the center of discussion. The field part of the course was given on the land of the Nekoosa-Edwards Paper Company, where commercial planting by means of tractors was demonstrated. The age of the students ranged from 65 to 25 years. Among the students were several logging superintendents of large companies planning to undertake selective logging on their holdings. The acid test of such a course is whether men, experienced in woods operations, actually learn some new things. One logging superintendent stated at the end of the course that he was going away from it with an entirely new idea of what forestry is and having actually learned something definite and concrete which he could put immediately into practice. Such a course is worth many general talks on forestry, and the new ideas generated by it are sure to keep "marching on."

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APPALACHIAN FOREST EXPERIMENT STATION

Loblolly Pine Study (M-3)

Early in the month MacKinney with Field Assistants Craig and Blidberg finished felling and sectioning the loblolly pine trees near Smithfield, Va., which are to be used in the study of the rate and location of increased growth in trees remaining after cutting. The sections were coated with a mixture of paraffin and gasoline, packed in moist sawdust and shipped to Asheville for measurement in the office. The paraffin treatment was found very satisfactory in preventing the sections from checking.

Upon the party's return to Asheville measurement of the Sections obtained in Smithfield was started. The work has progressed very satisfactorily to date, except that considerable trouble has been experienced due to discontinuous growth rings. In some respects these discontinuous rings resemble those described for redwood by Fritz and Averill. They occur most commonly in the zone of slowest diameter growth just prior to release and are probably due to shortage of food, especially on the side of the tree on which the rings are discontinuous.

On the return trip to Asheville MacKinney and Blidberg liberated some loblolly pine seed from the top of a 100-foot fire tower near Como, N. C., in a four-mile wind. The distribution of the seed was then obtained by counts on lines of milacre quadrats every half chain away from the base of the tower. The mode of seed distribution was found to be between 165 and 200 feet from the tower. Some seeds fell at 50 feet. The greatest distance from the tower where good seed were found was 350 feet. An attempt was made to get data on the dissemination of the seed in stronger winds, but the wind direction would not permit because of a large unharvested cotton field to leeward. A few observations were taken by eye which indicated the mode of distribution in a seventeen-mile wind to be between 450 and 500 feet and the extreme to be 1,000 feet.

Reproduction and Methods of Cutting - Hardwoods (Mc-2)

Computation of the field data of the Mc-2 extensive survey has gone forward during the month. Buell prepared a paper for the Southern Lumberman entitled "Preliminary Results from the Study of Cut-over Areas in Southern Appalachian Hardwoods," which reviewed the work done so far on this project, and presented a generalized table which shows the sort of information that the study will yield.

Forest Soil Study (Pf, A-1)

During last summer's field study it became increasingly apparent that the destruction of the leaf litter by fire may greatly influence conditions governing physical structure and fertility of the soil. Apparently a study of the forest floor will be a profitable and tangible approach to the study of the soil beneath it. Accordingly the observations on leaf litter in hardwood forest at Bent Creek, preliminary results from which, with reference to absorptiveness, were reviewed in last month's report, were continued in November by Dr. Hursh, assisted by Albert Beal.

The study is being continued for further data upon the 1928 leaf fall. It is not only the amount but also the distribution of the leaf fall that is important. Indications are that there is considerable movement of litter on the forest floor during the fall and winter, before the litter has become compacted. This movement, from exposed ridges and slopes to ravines and depressions, is being studied to determine its rate and the factors that retard or check it.

In addition to the determination of the amount of litter present, collections of litter from individual tree species have been made. These collections will be used for analysis and further studies of the comparative fertilizer value of tree species.

The general field covered by the soils study was reviewed by Hursh for the Christmas issue of the Southern Lumberman in a paper entitled "Litter Keeps Forest Soil Productive."

Biltmore Thinnings (Mt-1)

For inclusion in the Biltmore plantations circular the measurements of the thinned and control sample plots in white pine at Biltmore, made last month by Abell's party, were worked up by Craig and assembled with the results of the previous measurements. These figures representing 12 years growth are of considerable interest. They are summarized in the following tables, cubic volumes being computed tentatively on the basis of an assumed form factor of .5:

Control Plots (unthinned)

Old Orchard:				Age of : Apiary			
Age of	Good site (Plot 1 b)	Poor site (Plot 1 c)	plantation	Age of	Good site (Plot 4 b)	plantation	Age of
Volume	No. of trees	Volume	No. of trees	Volume	No. of trees	Volume	No. of trees
: per acre	: per acre	: per acre	: per acre	: (approx)	: per acre	: per acre	: per acre
Years	Cubic ft:	Years	Cubic ft:	Years	Cubic ft:	Years	Cubic ft:
18	3110	1984	2310	3176	20	4680	1425
24	3600	1424	2810	2384	26	5060	962
30	3730	872	2960	1696	32	5980	725

For plots 1 b and 1 c, although the average annual death rate for the past 12 years of observation was 93 and 123 trees per acre, respectively, the stand remains much too dense for the best growth. This overdensity is probably responsible for the slowing down of volume growth noticeable in the last six years. In plot 4 b, which is somewhat less dense, with an average annual mortality of 58 trees per acre per year, the volume growth in the last half of the period considerably exceeded that during the first half. The heights of the dominant trees in 1928 were about 53 feet in plot 1 b, 41 feet in plot 1 c, and 63 feet in plot 4 b.

Thinned Plots

At the time the experiments were started in the Old Orchard and Apiary white pine the stands were 18 and 20 years old, respectively. The Old Orchard stand was then extremely dense; if the sample plot numbered 1 a (see table below) had not been thinned its growth would undoubtedly have fallen off, as did that in the unthinned control plots 1 b and 1 c. The white pine in the Apiary plantation was exceptionally thrifty, probably because every other row of the planted pines had died, giving the trees of the surviving rows added space in which to develop. The thinned sample plot in the Apiary white pine is numbered 4 a; it is the companion of the unthinned plot, 4 b. The volume and number of living trees, on an acre basis, for these plots before and after the two thinnings and in the fall of 1928 are shown in the following table:

Date	Record made	Old Orchard (Plot 1 a)	Apiary (Plot 4 a)
		Volume : No. of trees	Volume : No. of trees
		per acre :	per acre :
		Cubic ft. :	Cubic ft. :
Sept. 1916	Before thinning	2710 : 2304	4680 : 1760
	After "	1980 : 1136	3550 : 952
Jan. 1923	Before "	2670 : 1056	4290 : 832
	After "	1760 : 508	2530 : 336
Oct. 1928	Before "	2570 : 504	3460 : 336

The difference in growth rate between the thinned and control plots in the Old Orchard white pine is very marked. In the thinned plot the annual growth between the first two thinnings was at the rate of 115 cubic feet per acre, while in the six years following the second thinning it amounted to 135 cubic feet. In the two control plots, combined, the annual growth for the corresponding periods was at the rate of only 32 and 23 cubic feet per acre, respectively. In the thinned plot, also, there was removed in the two thinnings a useful volume of wood equivalent to 1640 cubic feet per acre; in the control plots, of course, there was a total loss, through death and decay, of the wood volume which might have been salvaged by thinning. The thinned plot, with 504 trees per acre in 1928, is in a much more efficient condition for growth than the unthinned, overdense control plots, with 872 and 1696 trees per acre, respectively.

In the Apiary white pine, the annual growth rate between the first two thinnings (123 cubic feet per acre) was about double that for the corresponding period in the unthinned plot (63 cubic feet per acre); but for the six years following the second thinning the growth rate of the thinned and unthinned plots was about equal (150 cubic feet per acre and year, in round numbers). Evidently the second thinning was considerably too heavy and left the stand too thinly stocked for efficient production. It should be noted, however, that the growth of the unthinned stand was distributed among a large number of small trees, at the rate of 725 to the acre; while that of the thinned stand was concentrated on carefully selected, thrifty trees at the rate of only 336 to the acre.

ALLEGHENY FOREST EXPERIMENT STATION

Additions to the staff during the month include our Assistant Clerk, Julia Pruitt, Field Assistants Birger Berg from the Lakes States Station, and G. L. Godfrey from Connecticut; and temporary clerk Howard Geil.

E. N. Munns made his first visit to our new quarters to discuss administrative problems and the program of the station. He also made a trip to Camp Ockanickon.

The central location of the station is brought out by the increase in the number of visitors.

Forbes spent a good deal of time formulating his recommendations on the personnel of the Council, and lining up next year's program in a tentative way. A staff meeting to discuss future work, a conference with State Fire Warden Coyle of New Jersey on fire research, and discussions with Munns, proved very helpful to him on the latter job.

Management

Office computations are the order of the day, with Lutz working on the intensive plot data from the virgin area at Heart's Content and Hough analyzing the Mc measurements taken on the Little Arnot Plots on the Allegheny Forest.

Hough and Berg spent several days at Warren and on their return trip took advantage of the opportunity to spend a day with McIntyre and Demeritt at State College, in a discussion of forest types.

The seed studies at Camp Ockanickon continue. Two hundred sprouted acorns of white and chestnut oak have been located and marked with stakes, in an effort to find out why so few seedlings of these species survive.

Mensuration

Schnur spent three days with A. T. Cottrell on the Bass River State Forest in New Jersey, on a thinning project, securing tree measurements of oaks 2-6 inches in D. B. H. Utilization in New Jersey is closer than is common elsewhere, so supplementary data for the extension of our volume tables are necessary. Two oak yield plots were obtained by Schnur and Godfrey in the transition area between the upland and bottomland hardwoods in Maryland. These plots are the last the station plans to get in the ME- Oaks study.

SOUTHERN FOREST EXPERIMENT STATION

General

The Southern Forest Research Advisory Council met at Valparaiso and Camp Pinchot November 2 and 3. The attendance was disappointingly small, but the field trip and business session both led to much profitable discussion.

Two questions of special interest raised at the meeting concerned the possibility of determining definitely the effect of fire on gum yields in turpentine operations, and of using fire to thin overdense stands of young second-growth slash pine.

After the Council meeting Demmon drove to Starke with Wyman, by way of Tallahassee, where they discussed cypress studies with Professor H. Kurz of the Florida State College, and looked over a proposed purchase area with W. W. Ashe. Demmon stayed in Florida till the middle of the month, getting as far south as Ocala, and discussing cooperative studies with a number of people. He returned to New Orleans by way of Camp Pinchot, leaving New Orleans late in the month for Urania and Monroe, Louisiana, and Crossett and Hot Springs, Arkansas, mainly in connection with the thinning studies.

During the past month Teesdale of the Forest Products Laboratory arranged for moisture determinations to be made in a number of different places in local residences, as part of a country-wide study of moisture conditions and kiln-drying requirements.

Measurements

Barrett, Richter, and Harper made from quotient and taper studies on trees felled on the new thinning plots at Urania and bucked up the trees into pulpwood, which they stacked to test our cordwood converting factors. They also tested the Forest Service hypsometer by measuring with a tape the trees measured with the hypsometer and later felled in thinning. The Service hypsometer proved so accurate that when the check was repeated later a discrepancy between tape and hypsometer heights led to the discovery that the surveyor's chain used in measuring the base line for the hypsometer was two links short.

Management

Barrett, Richter, Harper, and Possin laid out reproduction plots (30 chains of strip each in loblolly, longleaf, and shortleaf)

in the Greeley Pasture at Urania, and 18 chains each on burned and unburned areas in longleaf in the Chapman Forest at Urania, where they also studied the flight of longleaf seed. They also measured and remapped the seedlings on the reproduction quadrats on the Brown Paper Company Land near Monroe. Pessin spent some time in New Orleans working up data on the new reproduction plots.

The principal management work of the month, occupying most of the time of Barrett, Harper, and Righter, was the laying out, measuring, marking, and thinning of plots and isolation strips in several new thinning series at Urania. Barrett also completed the revision of his working plan for thinning studies.

Naval Stores

At Starke the last dip and scrape was finished at all tracts. Field data were taken in an effort to determine the relation between the dense part of the tree crown and location of the turpentine face.

The naval stores exhibit material was sent to the Florida State fair at Jacksonville and shown from November 22 to December 1.

W. G. Wahlenberg was on detail at Starke throughout the month in place of Harper.

Gemmer made the final dip and collected scrape from Wyman's gum yield table tract at Camp Pinchot, and Harper and Wakeley made the final dip in the similar experiment at Kiln, Mississippi.

Forestation

Wakeley finished extracting and cleaning practically all of the seed collected by ourselves and cooperating State and private foresters for our own tests and those of the institutions to which we promised seed.

Wakeley practically completed the first revision of the manuscript which he and Professor Hayes, of the Louisiana State University Forest School, are preparing on the commercial plantations at Bogalusa. The University has promised to get the bulletin off the press within a very few weeks after the receipt of the manuscript.

Gemmer worked on a number of forestation reports, collected a little seed locally, extracted slash seed sent him by Wyman, and supervised the redigging of the trenches around the trenched planting areas. Only a few roots, and those thin and fibrous, had crossed the trenches in two years.

Wahlenberg visited the Forest Service nursery at Ocala and the Florida Forest Service nursery at Raiford, and collected seed of several species near Starke.

Ecology

Gemmer sowed longleaf seeds in the cans at Camp Pinchot, for the moisture requirements study. His meteorological work suffered some set-back because of the bursting of the black bulbs of his atmometers by frost.

Pathology

Lindgren spent the month on the West Coast and at Madison in connection with blue stain investigations.

Word was received of the appointment of Paul V. Siggers to take charge of the tree diseases work at the Station. Mr. Siggers starts work December 1.

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CALIFORNIA FOREST EXPERIMENT STATION

General

The field season came to a close in northern California the first week in November. Kotok participated as a member with the District Board of Fire Review on the California and Shasta forests. These annual boards of fire review have proved of great value not only in measuring accomplishment but equally as well in determining the trends of development of our protective system. To those interested in the fire protection problem it gives extraordinary background of current practices.

Kotok devoted a week at the District Ranger School at the Feather River Station, giving instruction in the basic principles of fire protection.

Kotok also spoke before the local section of the Society of American Foresters on present research problems in California and

participated at a meeting of the South Coast Range Divisional Meeting of the California Development Association. Under the auspices of the Los Angeles County Agricultural Extension Service, a series of radio talks over KFI have been made by members of the staff. Lowdermilk spoke on the "Water Harvest and Storage in Southern California." Kotok spoke on the fire problem in southern California and the forest research problems in southern California.

Forest Influence Studies

Kraebel and Lowdermilk made an examination of the Gibraltar Reservoir, the principal water supply of the city of Santa Barbara. Fifteen per cent of the tributary watersheds of this reservoir were burned over in recent years and large deposits of erosion debris have accumulated. This preliminary observation was made to determine the possibilities of correlating the silt accumulation with the fire history and the run-off of the watershed. The survey indicates that the task of an accurate measurement of the silt deposit is beyond our own present financial means and an attempt will be made to secure help from the State Department of Public Works.

Barranca Run-off and Erosion Study. Installation of an improved Venturi flume in the inlet to Barranca Reservoir was completed by Kraebel early in the month. Very satisfactory alignment of the structure was possible because of the firm foundation offered by the concrete floor and walls of the weir basin constructed last year.

During an examination of the big Cajon Burn of August, 1928, on the San Bernardino Forest, Kraebel secured a series of photographs illustrating the process of "dry erosion" which is usually very active in the southern California mountains after fire. The downhill creep of loose soil, usually started by wind or animals and by the differential expansion of surface rocks under the sun's heat, reaches large proportions on steep slopes of granite soil. Some indication of the magnitude of the process is observable along mountain roads in the south which sometimes cut through such alluvial deposits many feet in depth. It seems clear that the process may be at times so active as to have an important effect on the establishment of vegetation and hence on succession in burned areas. It would have to be taken into account in any plan for planting or sowing as measures of erosion prevention.

Several days were spent by Kraebel at Devil Canyon Nursery and several more on trips and conferences with members of the Los Angeles County Forestry Department on planting and nursery plans. A number of cooperative planting experiments were agreed upon for initiation

at the Tanbark planting area of the Los Angeles County Forestry Department on the Angeles Forest. Working plans are being prepared by Kraebel for duplicate experiments at Devil Canyon and Tanbark Flats.

From funds furnished by Santa Barbara City and County, two instrument stations for the measurement of climatic factors have been established on the Santa Barbara Forest. One is on the summit of the Santa Ynez Range and the other in the Santa Ynez Valley on the dry side of the range. A third station, partially equipped, is being maintained by the Blakeslee Botanic Garden in Santa Barbara on the coast side of the range. Because of the difficulty of getting observers who can attend the stations daily our installations are planned for operation on a weekly basis. Instruments now installed at each station include:

1. Hygrothermograph, Friez new type, weekly.
- 1 Set maximum and minimum self-registering thermometers.
- 1 Anemometer - 3 cup (with buzzer box for checking high velocities).
- 1 Standard rain gage.
- 1 Automatic recording rain gage, weekly.

Evaporation instruments will be added later. The recording rain gage is a new instrument employing the mechanical eight-day recorder invented by Lowdermilk in a housing designed by Kraebel. The first model, used last winter at Barranca Reservoir, showed minor defects which have been corrected in these later models. The gages were made by a small shop in Pasadena which is rapidly acquiring a reputation for the satisfactory manufacture to order of new scientific instruments.

Surficial Run-off and Erosion Studies. Surficial run-off and erosion studies in southern California occupied the major portion of Lowdermilk's time during the months of October and November. Two days were spent with the Fred Henson Company arranging for improvements in the Lowdermilk rainfall-run-off recording instruments. It has been found advisable to give up pencil recording and to return to pen and ink recording as was used in these studies in China. A special pen has been made and in tests has marked a continuous line for more than 120 feet in 10 days with one filling. This performance is considered satisfactory since the installations will be visited at least twice each week during operation of the instruments.

Arrangements were made for an installation of the surficial run-off and erosion experiment in cooperation with the Los Angeles Flood Control District through Mr. W. H. Hay, Chief of the Hydrographical Department.

Another experimental area was located in the upper limits of Devil Canyon watershed at an elevation of about 1000 feet above the Barranca installation. The installation of the Devil Canyon set-up was completed. It is with a feeling of relief that the slashed chaparral cover for the burned pair of plots was successfully and satisfactorily burned under the direction of Deputy Forest Supervisor C. A. Morris and Ranger Ed Buell of the San Bernardino National Forest. The interest and cooperation shown in these experiments by the administrative force is very gratifying.

Two installations have been put in operation. The cooperative San Dimas installation will be made soon after.

Studies in Water Conservation. The California State Legislative Committee commissioned to make a state-wide study of the problems of conserving the water supplies of the State held a meeting at San Bernardino on October 18, at which Lowdermilk briefly outlined to the committee the place of the mantle of vegetation in keeping runoff waters clear or as clear as is possible. Clear water or very low silt content is a prerequisite to the sinking of storm waters in the outwash fans at the margins of the valleys of southern California. The State engineer finds that 95 per cent of the water used in this region is pumped from underground basins. These basins are deep porous detrital filled valleys, brought about by great differential tectonic movements and the rapid erosion of the uplifted mountain hoists and blocks. These detrital filled basins form a depository for flood waters and were filled to overflowing at the beginning of the agricultural development of southern California. The draft on these basins has been greater than the intake so that the plane of the water table has lowered to such great depths as to cause grave concern to those dependent on underground water supplies. Any water which rushes by into the sea is looked upon as water lost and wasted. Concentrated effort is being made to sink all storm waters into the porous outwash fans at the valley margins to replenish the failing underground basins. Regulated and clear waters assure the maximum conservation of water by this means of storage. Experience of the region and Lowdermilk's experiments indicate that silt laden waters tend to seal up the surface pores of the soil and thereby to reduce and hinder the percolation of waters into the soil. Storage of winter storm waters underground is facilitated by their clarity which is again dependent on the completeness of the mantle of vegetation.

Criteria of Erosion Norms. As a continuation of his studies in erosion, Lowdermilk at odd times for a number of days has been making a preliminary analysis of southern California topographic forms as criteria of erosional norms for climatic types and corresponding vegetation as affected by certain tectonic or fault movements. These pre-

liminary observations are to furnish the basis for a systematic analysis of criteria of geologic and climatic norms of erosion preliminary to a thorough study of the subject of both normal and abnormal or accelerated erosion in its varied phases. Such a study is considered basic to his attack to be made on the problems of erosion control at a later time.

Management

Dunning is busily engaged in preparing material for two manuscripts, one dealing with the methods of cutting plots and the other with our preliminary investigation in root studies. Dunning installed this month his special plots in connection with the study of natural regeneration in the sugar pine - fir type on the Stanislaus center.

The weather this fall has been very unfavorable for fall planting. No rain fell until the first week of November and in some localities the ground was not wet deeply enough for planting in that storm. The second storm brought heavy snow. Twelve hundred trees have been planted and staked by Siggins on the Shasta, Plumas, and Stanislaus forests.

Hormay has been pushing the work of leveling the Feather River nursery. New terrace planks have been installed and about fifteen yards of sand have been hauled in for soil improvement.

Siggins has extracted seeds from 34 lots of cones sent in for the seed dissemination study. The flight tests are now in progress.

Cover Type Map

Northern California. Two crews are still in the field in the Santa Cruz Mountains. Provided no bad storms develop the Santa Cruz County map will soon be completed so that finished maps of this county together with San Mateo County can be worked up this winter.

Southern California. Wieslander spent the last half of the month on the San Bernardino Forest instructing two district and one assistant ranger in type mapping and sample plot technique. These men have been assigned to the job by Supervisor Boulden until the opening of the 1929 fire season. Additional assistance may be forthcoming from the District Office and the goal is to complete for the San Bernardino Forest this winter a cover type and fire hazard map similar to one completed for the Angeles last winter.

Products

Director Winslow of the Forest Products Laboratory and Mr. Heritage of the Pulp and Paper Section completed their visit to this District, Winslow returning on November 2 and Heritage on November 6, after conferences with pulp and paper men and with the Joshua Hendy Iron Works in respect to application to pulp manufacture of their new balanced rod mill.

Blue Stain. Brundage has been at Pinedale the entire month on blue stain dipping work. A large amount of lumber has been dipped with Fungimors in varying concentrations and with other variables indicated as desirable in last year's experience. That Fungimors is reasonably safe for bare-handed use was indicated when a big Swede helper fell into the vat and even got a mouthful of the solution without any subsequent ill effects. A quantity of the Swedish blue stain preventive "Nekyan" was also finally obtained by ship and connecting express in time to be used in the experiments. Two new chemical compounds concocted by Du Pont are also being tried out. These apparently can hardly be handled with the impunity of Fungimors since they are so powerful that the solution for dipping used is at a concentration of only a small fraction of 1 per cent.

Wood Preservation. Hill was called to inspect the worst case of building destruction by dry rot, probably Poria incrassata, which he has ever witnessed. The building was a frame stucco funeral parlor in Berkeley built only thirty months ago. However, nearly every rule of good construction with respect to protection against decay had been violated. 2 x 10-inch studding could be kicked in two with the foot and the entire wood construction below the main floor was covered with a white mantle of mycelium. The destruction had proceeded up the walls nearly to the second story.

California Economic Research Council. Hill's committee on Natural Resources has undertaken to bring together the various interests concerned in the use of topographic and other base maps for the purpose of finding out where and what the deficiencies are in the base map covering of California and bringing about a cooperation between the State and the Geologic^{al} Survey and General Land Office looking toward the speeding up of their work so as to fill the gaps in accordance with a systematic program based upon priority of needs. This will greatly assist the work of the Station on the cover type map which is seriously handicapped by the lack of accurate base maps in several regions of the State.

Entomology

The time of Person, Struble, and Mirov for the past month has all been spent on the preparation of reports on the field studies of 1928 conducted at the Bureau of Entomology field laboratory on the Modoc National Forest. Mirov has completed the preliminary draft for a report on the attraction studies with the western pine beetle (Dendroctonus brevicomis). In these studies D. brevicomis showed a preference for the bark and phloem, both fresh and fermented, of western yellow pine. Oleoresin and especially some of the volatile oils with low boiling points were found to be unattractive or repellant.

Struble has about completed his report on preliminary studies of the life history and habits of some of the secondary coleoptera associated with D. brevicomis. Most of his work was done on the staphylinids and histeriids and a tenebrionid, Hypophloeus porallelus. Platysoma punctigerium, an histerid, was found to be predaceous in both the larval and adult stages. Though predaceous on D. brevicomis it is probably not of great importance as such.

Biology

Horn spent most of the month on purely control endeavors involving pharmacological studies and the life habits of some of the important rodents of the region.

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PACIFIC NORTHWEST FOREST EXPERIMENT STATION

Wind River

Simson spent most of the month at Wind River concluding the igniting of snags in the snag-falling study, drying down the twenty-one large fuel samples used in measuring the hourly fluctuation of fuel moisture content, and doing considerable office work. The instruments have been put away and everything left shipshape for the winter when he moved to Portland just before Thanksgiving. Munger made one short trip to Wind River, particularly to take an inventory of the arboretum nursery and go over Simson's program with him.

Douglas Fir Natural Reproduction Study

Isaac completed the final examination for the season of the natural reproduction plots on Douglas fir cut-over land. He reports that reproduction of the region as a whole is light, and apparently is ordinarily in proportion to the seed crop of the preceding year. Except at high altitudes the Douglas fir seed crop is poor again, making the fifth unfavorable seed year in succession. This is longer than the usual span between heavy seed years in the Douglas fir type. In order to make sure of having seedlings to study on the intensive plots at Wind River where the physical factors of site are being measured and also where sheep grazing is being carried on, the plots were seeded artificially, in most cases by merely stepping the seed into the ground and covering with a wire cone. The test of Douglas fir seed storage in the duff was replicated by burying in the virgin woods and in open ground a few cages of seed, one of which from each site will be taken up and germinated each year.

Computations

An inventory of the pending office work, chiefly resulting from Westveld's and Meyer's studies of methods of cutting and of yield in the yellow pine region, indicates that there is enough to keep three persons busy for three months. Kolbe will take general charge of this work and be assisted by Ranger Moravets and Miss Ball. Moravets has been assigned by the District Office for three months and is familiar with our work because he was employed all last winter at this Station. Kolbe spent the greater part of November in connection with the diameter distribution study which Meyer is making, and also in bringing up to date the Rainier permanent sample plot records. To replace the Dalton adding machine which was purchased for Wind River Station some thirteen years ago, a new hand-power Sundstrand machine has been bought.

"Forest Research Notes"

"Forest Research Notes" is the title of a mimeographed circular which the Station will issue hereafter three or four times a year to give the profession and industry brief accounts of its current activities and findings. The first issue went out this month to a mailing list of 300. These "Notes" will be brief even at the expense of completeness and will be designed primarily for the practicing forester, both private and federal in the Pacific Northwest. The first issue contained -

Lightning Storm Frequency on the National Forests.
Relation of "Average" to "Fully-stocked" Stands
of Fir.

Growth in the Spruce-Hemlock Type.

Growth of a 1912 Plantation.

Station News Items.

Considerable favorable comment has been received about this first issue of "Forest Research Notes." One friendly comment intended for all Forest Service workers, we might well all take to heart. He says "This is a splendid idea. One criticism I have heard lumbermen make of Forest Service workers as well as workers in the schools and elsewhere is that it takes these workers too long to get their material out where it may be used. They say that if the success of their business depended on our reports they would all go broke before the reports were available. Your Forest Research Notes will in a large measure meet this criticism." As a preliminary to getting out this circular regularly, a mailing list was carefully prepared by Miss Wertz and the Director and put on addressograph stencils.

General

The agitation to formulate a better system for taxing cut-over lands and immature forests has continued to take considerable of Munger's time, and he presented the report of the Forestry Committee to the Directors of the Chambers of Commerce, who have now formally endorsed the program.

For the information of the committee of the Logging Congress, which is studying the standardization of log scaling and grading practice for the Douglas fir region, Munger prepared a memorandum listing sixteen reasons why the cubic foot unit of measure would best meet the present unsatisfactory condition.

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NORTHERN ROCKY MOUNTAIN FOREST EXPERIMENT STATION

The assembly and compilation of field records, and the preparation of individual work plans for the winter, have been the major occupations of the Northern Rocky Mountain Station, as usual during November.

In the methods-of-cutting, and the growth and yield studies, field records were checked, descriptive material completed, and detailed plans made for the compilation and analysis of the data now available. Outlines also were prepared for several articles on these investigations, that should be written for early publication. Page proof of the leaflet "Second Growth Timber Worth Holding in the Northern Rocky Mountain Region" was corrected, so that this contribution to private forestry practice can be issued as soon as possible.

Mr. Emil Ernst, a field assistant on the cutover area study crew during the past season, after further investigation of some samples collected on the work, reports an apparently new discovery of some morphological interest. Ernst and Haig observed resinous exudations on cedar stumps, and collected samples. The occurrence of resinous tissue, possibly of traumatic origin, on western red cedar, is not reported in any of the standard texts on wood technology, so far as can be determined. Under the direction of Professor Severy of the botany faculty at the University of Montana, Ernst is now making a detailed study of this interesting phenomenon.

To organize the existing data, and to commence compilation of the large volume of results of the reproduction study, Field Assistant J. W. Zehnder, a graduate Swiss forester from the school of forestry at Zurich, has been engaged on the job in the office for the last four weeks. The contents of each plot folder are being checked to determine the presence or absence and degree of completeness of establishment reports, original field records, and compilation sheets. A master-sheet is also being made for the project, giving a brief description of each plot, its number, size, location, number of reproduction quadrats, number of trees, season and frequency of re-examination, etc. This should help very materially in showing and in estimating the volume of work included in each project. Accurate time checks were made in the field during the last fall examinations, so that in the future estimates of the time needed for the field work may be made with very reasonable accuracy. As there are over 800 reproduction quadrats, all of which are examined once a year and some twice a year, the present office work is a job of some importance and magnitude.

A start has been made in the compilation and analysis of four seasons of twice-daily fuel-moisture and inflammability measurements on three sites, clear-cut, half-cut, and fully timbered areas, at the Priest River Station. In the past these measurements have served currently as checks on opinions and estimates of prevailing fire danger. The data are being examined now to discover whatever consistent conditions they may reveal. Although four full fire seasons are included, there are only twenty-six cases of truly beneficial rains which can be used as commencement dates from which to

compute the duration of safety according to different types of weather on each of these three sites. After these records have been fully analyzed it is planned, and hoped that time will be available, to compare statistically the similar records obtained at five other inflammability stations in this District.

Analysis of the D-1 lightning storm data was delayed last year for the first time, merely the record of thunderstorm days by Forests being computed for the benefit of the Weather Bureau. Coding of the reports for 1928 is to be commenced early in December, and when this material is returned from the tabulating machines there will be dependable data for five consecutive seasons ready for summarization. Whether or not this can be completed before the opening of the 1929 season will depend upon the assistance available and the date of first field work next spring. As usual, the District is contributing a ranger to aid in the work of coding these reports, the Experiment Station being called upon merely to pay that man's expenses.

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DISTRICT 2 (October)

October Activities

Except for one day spent at the Monument Nursery, all activities for the month were confined to the Fremont Station. October usually sees the end of the season's field work, but the field season this year will be extended to November 10 in order to complete small tasks which demand attention.

M-1

One plot in north slope Douglas fir and spruce was cleaned up during the month, including the scattering of the brush. The cutting also of 4 acres mistletoed timber was accomplished. What are believed to be the oldest trees of Douglas fir (345 years) and western yellow pine (316 years on the stump) so far cut at Fremont were removed at this time.

About 30 plots, most of which are 200' square, were added to the experimental forest for growth and yield study purposes.

During the first few days of October the check plot of the "methods of cutting in mature Douglas fir" group was remeasured for the fourth time since 1916, and a tally was also made of the number

and volume of advance aspen sprouts on the clear-cut plot. It is now 12 years since this 200x200' plot was clear-cut, but the advance growth of coniferous reproduction resulting from seed on the ground at the time of cutting is negligible in quantity. The same is true of all subsequent reproduction, and it is doubtful if this area will restock to normal capacity for the next two or three rotation periods.

Seed Studies

Fall examination of the small Douglas fir seed source plantation established in the spring and involving seed from two local seed trees, desirable and undesirable, indicated a slightly higher survival for the progeny of the desirable tree. It is believed this is due to better developed trees at four years and ability to withstand to a greater degree, because of this better development, the severe fall drought which hit the Pikes Peak region this year.

The lodgepole pine seed source plantation, also established during the past spring, was especially hard hit by this drought. It is doubtful if the few eventual survivors of this more or less ill-fated lot of seeds will give any very conclusive results.

A three-year measurement was made of the stock in the 1926 Douglas fir "vigor-class" seed source plantation in Block E. It is probable that more definite results will be obtained from the survival and amount of winter-killing observations than from height measurements, since growth in this plantation has been quite slow.

Final counts for the year were made on October 10 of the 1-0 western yellow pine stock at Monument representing the progeny of various individual seed trees with outstanding characters which are to be studied. The most striking thing to be noticed is the progressive decrease in size of seedlings with increased elevation of the parent trees. Several lots of seedlings are also included in this group resulting from artificial crossing tests. These seedlings are uniformly smaller than are those derived naturally. Four seedlings represent the total crop obtained from seed procured in selfing tests. The development of these, however, will be closely observed.

The cones obtained from the 20 special Nebraska seed trees were air-dried, and an appreciable quantity of seed was obtained, which will be sent to the Bessey Nursery for sowing in the spring.

Type and Special Studies

Surface soil temperature observations in the type study (T-1) at 14 stations in a valley transect were discontinued at the end of the month, and the experiment was placed in its winter status.

An examination was made of the western yellow pine trees which were artificially inoculated with mistletoe in the fall of 1926. The term "inoculation" is used advisedly, since the test involved nothing more than placing the seed of the parasite in leaf axils and on the bark of twigs near their outer extremities. Two trees of the type commonly attacked by mistletoe locally and two of the supposedly immune type were thus treated. No infection has been procured in any case to date. The presence of more seeds and seed shells on the "mistletoe" type leads one to believe that greater ease of infection (if it is at all possible that the immune strain may become infected) is due to faster growth of branches, which offers a greater area open to attack, possibly to more "succulent" bark resulting from this more rapid development, and to the retention of old needles longer than they are retained by the immune strain, which offers more lodging opportunities for mistletoe seed and more points at which infection may take place.

During the middle of September, Drs. Hedgcock and Long of the Office of Forest Pathology visited the Jarre Canyon thinning plots in sapling Douglas fir to study the so-called "pitch girdle" disease which is prevalent in the vicinity. The result of the visit leaves the disease still unidentified, but the prospects are fair that an expert will be detailed to study the occurrence and habits of this strange malady.

Following the D-2 ranger training camp, which is conducted annually at Woodland Park on the Pike Forest by Mr. R. Keplinger of the District office, Mr. Gilbert Varney, one of the trainees, was assigned co-jointly to the Pike Forest and to the Experiment Station.

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DISTRICT 2 (November)

November Activities

The first decade was spent by Roeser at the Fremont Station in closing up the field work, mainly in connection with the management of the Station forest (M-1); type (T-1) and Nebraska seed source (FS-101(d)) studies. These tasks were described to some extent in last month's report.

Outdoor work at Fremont has been greatly curtailed by the early advent of winter. Two extremely heavy snow-storms came a week apart

and all but snowbound the Station. A total precipitation of 3.42" and almost three feet of snow far exceeded all previous records. The precipitation figure is 4.7 times normal.

T-7

The latter part of the month was employed to compile and summarize the data which have been obtained since 1925 in the mass transpiration test which is being carried on in the Fremont greenhouse. Full and comparable stands have now been developed in eight of the twelve cans involved, and while no conclusions regarding the relationship between mass growth and transpiration will be available until the test is ended and the trees are dried and weighed, some information is gleaned on the water requirements of fully stocked stands of young trees. In a light loamy soil western yellow pine transpires somewhat faster than pinon pine per unit of area, with limber pine making less demand than either. Per tree, western yellow pine uses about $\frac{2}{3}$ the amount used by pinon. In a heavy soil, to which pinon pine is better adapted than the other species, but in which it has not shown any tendency to better development than in the light soil, pinon pine consumes about 2% more water per unit of area than does yellow pine and 13% more than limber pine, and almost again as much per tree as either of the other species. For a $2\frac{1}{2}$ year period the average use per square foot has been 155 grams per day for pinon pine, 152 for western yellow, and 134 for limber pine. This in the heavy soil. In the light the respective figures for western yellow and pinon are 140 and 131. Comparable data cannot be offered for Douglas fir, Engelmann spruce, and lodgepole pine because of the longer time it has taken to procure complete stocking.

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MANUSCRIPTS

Appalachian

Litter Keeps Forest Soil Productive, Chas. R. Hursh (For Southern Lumberman)

Cut-over Lands and Forestry in the Southern Appalachians.
E. H. Frothingham. (For Gopher Peavey)

Forest Plantations at Biltmore, N. C. F. W. Haasis (For Dept. Cir.)

Preliminary Results from the Study of Cut-over Areas in Southern Appalachian Hardwoods. (For Southern Lumberman)

California

Methods of Cutting Study, Stanislaus National Forest Progress Report 1925. Howard W. Siggins.

Allegheny

Probing the Forest's Mysteries. R. D. Forbes. (For Greater Pittsburgh, Pittsburgh Chamber of Commerce)

Increased Growth of Released Hemlock. H. J. Lutz. (For Journal of Forestry)

In Print

Meyer, B. S. Seasonal variations in the physical and chemical properties of the leaves of the pitch pine. American Journal of Botany. Oct. 1928.

Meyer, W. H. Understocked stands. Journal of Forestry. October, 1928.

Pearson, G.A. Measurement of Physical Factors in Silviculture. Ecology, Vol. IX, No. 4, Oct. 1928.

Submitted to J. A. R. for Publication

Bruce and Reineke. Use of Alinement Charts in Constructing Stand Tables.

Bates, Hilton,
and Krueger. Natural Reproduction of Lodgepole Pine on Experimental Cutting Areas in the Central Rocky Mountains.

Wahlenberg, W. G. Effect of the Amount of Seed Sown and the
Density of Seedlings on the later Develop-
ment and Survival of Western Yellow and
White Pine and Engelmann Spruce.

Hadley, E. W. Effects of Burning and Cattle Grazing upon
the Survival of Longleaf Pine Seedlings.

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OFFICE OF FOREST PRODUCTS -- District One

Third Tree-to-Mill Green-chain Study in Western Yellow Pine Completed During November

Field work on the third of a series of logging and milling studies to determine the cost of production and the value of the products from western yellow pine trees of different sizes was completed November 10. This particular study was made in cooperation with the J. Niels Lumber Company of Libby, Montana. Mr. Bradner and Mr. Anderson of the Products Office were assisted by Mr. Webb, D-1 Logging Engineer, and four Forest officers from the Kootenai National Forest. The company furnished the lumber graders for the mill end of the study, and members of both the woods and mill forces helped to make the work run smoothly.

The study was made in the western yellow pine type of western Montana. Approximately 20 acres of timber were logged during the study. Ownership of the acreage logged was about equally divided between the Forest Service and the company. The timber on the Government sale area was marked for cutting by the Forest officer in charge of the sale. Under the method of marking used, a considerable stand of thrifty young trees was left on the area.

The trees were felled and bucked into long logs (24 to 40 feet) by the sawyers, yarded with horses, and skidded with caterpillar tractors. In the two previous studies, the timber was skidded in tree lengths and bucked into short logs at the landing. Five tractors were kept busy on the job, and the acreage "cleaned up" during a day's work was considerable. Two log scales were made by the Forest Service scaler. The long logs were scaled at the landing in the woods and rescaled on the log deck in the mill when they had been bucked into short logs. These two scales will give a check on the accuracy of scaling long logs in front of a steam loader. Logging costs were obtained by tree sizes. Data on 32 cars of long logs (approximately 1200 short logs) were obtained.

A piece tally by grades and sizes at the mill green-chain was made for the individual logs. Tree and logs were so numbered in the woods and checked through the mill that the mill data on the short logs may be easily worked back into the original tree.

Because of the lateness of the season and freezing conditions in the mill pond it was necessary to run a double shift at the mill. The crew was split so that it was possible to work both the night and day shifts.

Statistics of Production and Receipts from Lumber Industry Find Use
in Economic Survey

Dean Miller of the University of Idaho School of Forestry has undertaken a comprehensive economic survey of Benewah County, Idaho, and recently requested figures on the quantity and value of forest products manufactured in the county for a period of years. The information sent to Dean Miller was compiled from the reports of individual operators for the years 1923 to 1927, inclusive, and will bring up to date some of the tables published in the Idaho Forest and Timber Handbook.

The value of having the lumber census taken by the Forest Service is apparent in a case of this kind. Without the records and reports of individual operations which have been tabulated in the District Office it would be impossible to compile information needed for such special purposes.

Lumbering has always been the most important industry in Benewah County, but as shown in the following table the total output and value of sawmill products are rapidly falling off.

COMPARATIVE STATISTICS - BENEWAH COUNTY, IDAHO, 1923-1927

Year	No. of Mills	Total Production	Total Value of Products Reported	Persons Engaged
	: Active : Idle :	M feet	by mills	Sawmill Operations Only (No.)
1923	17 : 2 :	108,243	\$ 4,111,303	1933
1924	13 : 4 :	99,342	3,095,749	No record
1925	8 : 4 :	91,208	3,044,269	827
1926	9 : 3 :	58,809	1,776,808	No record
1927	6 : 4 :	43,507	1,226,400	357

In this county lumber production reached its maximum in 1923, but there was also a large cut in 1924. In 1925 the total cut was about the same as the 5-year average for the period from 1920 to 1924 but in the past two years it has shown a marked decline. This shrinkage of production has been accompanied by a reduction in the number of mills operated and smaller productive capacity as reported by the remaining active mills. In 1923 the 17 sawmills operating in Benewah County reported a total productive capacity of 508 M feet per 8-hour shift, but in 1927 there were only six active sawmills, reporting a total capacity of 281 M feet per 8-hour shift.

Since 1923 one large mill and eight smaller mills have gone out of business and it appears improbable that the aggregate lumber cut of Benewah County will again approach the total amounts reported in 1923 and 1924.

It is understood that Dean Miller's survey will cover practically the entire land area of Benewah County and require about two years for completion.

Tons of Sawmill Waste Available for the Production of Charcoal

A large eastern power company interested in the development of one of the district's power sites made, during the summer, a rather intensive study of the possible uses for the great amount of electrical power that would ultimately be developed. A chemist representing the company made a rather comprehensive study of the electrochemical industries that might prove applicable to this region. In his study, he found need for information on the charcoal-producing possibilities of the district, and called on the Office of Products for assistance. The chemist intimated that the industries he had in mind would require 10,000 tons of charcoal monthly.

Good charcoal can be produced from most of the district's softwoods, but in collecting the information, the Office had in mind the utilization of woods or mill waste or the use of some little-used species. The Office of Products was able to furnish, with the help of the Kaniksu and Deerlodge Forests, the following information:

1. The quantity and availability of lumber mill waste --
 - a. By species for groups of mills located within a 150-mile radius of the proposed power plant.
 1. Total annual cut by mills and species.
 2. Total amount of sawmill waste on a dry-weight basis (15%) exclusive of salvage in fuel wood, lath, short box, moulding, and plant fuel by individual mills and by species. (This data was obtained from the District Sawmill Studies.)
2. The practice, technique, woods used and yields, etc., of the open-pit method of charcoaling in Idaho and Montana. (This information was furnished by the Deerlodge Forest.)
3. Location, approximate acreage, and estimated quantity of wood available on the lodgepole pine areas within a 30-mile radius of Newport, Washington. (This information was obtained from the Kaniksu Forest office.)

Some interesting figures from the estimates of sawmill waste are given below.

The Coeur d'Alene (Idaho) group, containing six mills, has an average annual cut of 202,680 M feet b.m. and produces 101,710 tons annually of sawmill waste, dry weight, exclusive of salvage in fuel, lath, moulding, short box, and plant fuel. The Sandpoint (Idaho) group, with three mills, shows an annual cut of 116,745 M feet and a loss in waste of 57,550 tons. The Lewiston (Idaho) group, composed of six mills, shows the highest annual cut -- 213,115 M feet -- and, consequently, the greatest amount of mill waste -- 106,180 tons. In all, five mill centers were found which were within a 150-mile radius of the proposed power plant. Twenty-three mills were included in these five groups. The average annual production is 870,535 M feet, and the annual amount of sawmill waste is 431,600 tons.

The mill-scale data showed that 1980 pounds (green weight) of sawmill waste resulted from the production of 1000 board feet of western yellow pine lumber. In producing a thousand board feet of lumber from western white pine, 1820 pounds of waste resulted. The weight of the waste per thousand board feet of lumber sawed was 1910 pounds for western larch and 1540 pounds for Douglas fir. The green weight of the species, the character of the product cut, the value of the products, and the methods of sawing are factors all of which affect the amount of waste which results.

Lumber Prices and Movement

Av. Mill-run Prices	Annual	Annual	First Q.	Second Q.	Third Q.
	1926	1927	1928	1928	1928
Idaho White Pine	\$35.86	\$30.17	\$30.20	\$31.00	\$31.00
Western Yellow Pine	25.17	24.19	26.55	25.52	26.08
Larch-Fir	18.19	16.38	17.60	18.23	19.23
White Fir	17.41	16.80	17.89	17.35	18.75
Spruce	23.39	25.67	24.35	21.21	22.69

<u>Shipment and Cut</u>	<u>October, 1927</u>	<u>October, 1928</u>
Shipment	141,376 M	170,271 M
Cut	124,433 M	150,536 M

Miscellaneous

Mrs. Bullard completed the quarterly lumber and cedar-price reports during the month.

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OFFICE OF FOREST PRODUCTS - District Six

Logging and Milling Studies in the Western Yellow Pine Region

Mr. Spelman spent about one-half the month computing the time required to saw each of 2,000 logs in the case of the Mt. Emily Lumber Company study conducted last fall, with the balance of the month employed in connection with the felling and bucking time study at the Shevlin-Hixon Company.

Mr. Johnson's time was largely employed in connection with the computing of the data secured in the Shevlin-Hixon Company mill study.

General Survey of Wood Waste in Logging in the Douglas Fir Region

Mr. Hodgson's report has been reviewed by several of the local Forest Service officers, with his month given over to a revision of the report.

Kiln Drying Study in Douglas Fir Region

Preliminary to a study of kiln drying methods in the Douglas fir region of Oregon and Washington Mr. W. K. Loughborough of the Forest Products Laboratory started to make a general survey of conditions the middle of the month; in this general connection he will spend the bulk of December in District 6.

Publications

Mr. Hodgson's paper entitled, "Logging Waste for Pulp Wood in the Douglas Fir Region," which he presented last month at the Pulp and Paper Conference at Seattle, was printed in the November 1 issue of the West Coast Lumberman. This paper also served as a basis for extracts and editorial comment by The Timberman and the Pacific Pulp and Paper Industry.

Reprints of Mr. Johnson's report "Degrade in Air-Seasoning Wide Douglas Fir Common Boards" were distributed during the month.

FOREST TAXATION INQUIRY (October)

Pacific Northwest

The collection of assessment and taxation data in the selected counties and school districts of Oregon was completed in the early part of the month. Similar work in Washington has also been finished, except for some of the clerical work, arrangements for which have been made. In view of the critical economic situation in the Grays Harbor region and of the other work being conducted there under the leadership of the Western Forestry and Conservation Association, a very complete tax study is being conducted in Grays Harbor County. The other Washington counties finally selected for intensive study are Clallam and Lewis. A very general survey of Jefferson was also included. The work in Grays Harbor and Lewis Counties was supervised by Herbert and that in Clallam and Jefferson by Pingree. Both Herbert and Pingree completed the necessary supervision during the month and returned to New Haven about the thirty-first.

Allin, who joined the organization the last of the preceding month, has begun the study of the financial conditions of the State of Oregon and of the selected counties. After about a week at Portland getting acquainted with the general scope of the study and with the sources of data available there, he was introduced to the State officers at Salem by Hall and spent a few days there getting a line on state finances. Hammar, having finished his work on the tax system in Tillamook and Clatsop counties about the middle of the month, was assigned to work with Allin on county finances.

Fairchild joined the force in Portland on October 12, having stopped on his journey West to attend a meeting at Hot Springs, Arkansas, of the Committee on State and Local Taxation of the United States Chamber of Commerce. After getting in touch with the status of the different projects he gave considerable time to going over the financial studies with Allin both prior to and after a sample county had been surveyed. Together with Hall he attended a meeting at Portland of a special committee appointed by the Governor of Oregon to consider tax legislation favorable to private forestry and responded to requests both for a general presentation of the subject and for advice on specific points.

Fairchild also gave some time to a special consideration of the Grays Harbor project, attending conferences on that subject in Hoquiam and Seattle. He made further contacts with the State Tax Commission at Olympia and with others interested in the Washington study, and gave a talk on the investigations of the Inquiry before the Research Club of the State University at Seattle. He returned to New Haven at the close of the month.

The study of taxation in relation to the business of holding and operating timber lands being conducted largely by the questionnaire method has progressed to the extent that about thirty-five of the completed statements have been received from timberland owners and operators. This is as good a return as could be expected in view of the short time that has elapsed since sending out the form statements. Hall was able to give a little time this month to follow-up work, but in view of the importance of "striking while the iron is hot," it was decided that his return to New Haven should be postponed until he has had more time for this project.

New Hampshire

In New Hampshire Murphy was able to bring the work in Fremont to a close early in the month and begin work in Richmond, which is the third town to be studied during the year according to current plans. Richmond is a large town, 24,000 odd acres, which reached its maximum population development about 1810 and its maximum property development just prior to the Civil War. Since the latter date economic development has ceased and the town gradually declined until at present evidences of its former development are mainly to be found in vacant cellar holes, in mile upon mile of abandoned road rendered impassable by forest growth, and in the forest growth on much of its former cleared lands. Indeed sufficient time has elapsed in many cases so that a crop of timber has been removed from these lands and a second one is now in process of development. Due to portable sawmill operations the town has been largely stripped of its forest resources and its former pine areas are now in possession of inferior hardwood growth for the most part. In spite of the physical obstacles encountered, particularly inability to use any type of conveyance over a considerable extent of the former road system, the work has progressed remarkably well. Thus, while Murphy returned to the office at the end of the month to begin the preparation of the report on the summer's work, Messrs. Fitch and Allen, two local men who have been assisting him, remained and expected to complete the field work before election day.

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FOREST TAXATION INQUIRY (November)

Fairchild returned to the New Haven office early this month. He and Chapman went over Chapman's final reports on the Minnesota Project. To Pingree has been assigned the task of combining these reports with the other Minnesota studies and preparing progress reports covering those points of special interest.

The work of collecting data for the study in the Pacific Northwest has progressed during the month of November, with the number of technical men engaged there reduced to three. Allin and Hammar have been visiting the county seats of the selected counties in Oregon for the purpose of getting the data on county and local government finances. They have completed all of this form of work in Oregon and have made a start along similar lines in Washington. Incidentally, Hammar has spent some of his time finishing various details on other projects which remained to be done at certain of the county seats and at Salem.

Hall has devoted most of his time to following up the questionnaires which were sent to the larger timberland owners through interviewing many of these owners or their representatives in the regions of Portland, Seattle, and Tacoma. He attended a meeting of the Executive Committee of the Washington State Forestry Conference at Seattle and has spent some time in getting all the available statistical information on forest conditions. Hall left for the East on November 26 and will soon be on duty at the New Haven office.

Murphy and his temporary assistants finished the field work in the third New Hampshire town the first of the month, thus completing the field work planned for this season. The compilation of the New Hampshire data was immediately gotten under way in the New Haven office. Reineke spent a day with us planning the Hollerith card, which is now being punched. Murphy, in addition to supervising the New Hampshire study, is finishing his abstracts of state forest tax laws. He left near the end of the month for Washington, D. C., where he plans to complete this project and also to be on hand while the first New Hampshire town data are put through the machines.

Herbert and Pingree have been preparing the Oregon and Washington field data for compilation. The statistical and clerical staffs under Miss Epps and Mrs. McGindley are devoting approximately half of their time to the Oregon work and half to New Hampshire.

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RANGE RESEARCH

WASHINGTON

Mr. Chapline presented a paper, entitled "Erosion on Range Land" at the erosion symposium, American Society of Agronomy held in connection with the recent Land Grant College meetings. Mr. Munns also read a paper by W. C. Lowdermilk of the California Station on "Erosion in the Orient as Related to Soil Conservation in America." The discussions brought out the importance of forests and range vegetation in the control of erosion and in other phases of watershed protection, particularly water delivery, prevention of excessive silting of reservoirs and reduction of flood danger. Considerable interest was manifest in support of additional research on erosion. The unusually good slides prepared especially by Mrs. Brenizer of the Branch of Public Relations added interest and several of the audience commented on the perfection of the slides.

The Proceedings of the First International Congress of Soil Science, June 13-22, 1927, have been received. Mr. Chapline's paper "Controlling Erosion of Range Land Through Range Management" is published in volume 4.

FORAGE INVESTIGATIONS

November was not a month of striking developments in this project but was marked chiefly by the prosecution of work that will be discussed in the December or January reports. Hunn finished editing the Glossary and Dayton has gone through the editorial changes and suggestions and reported on them to Chapline. Considerable progress was also made on other publications.

Plant Work During November

One collection of 73 plants was submitted to the Bureau of Plant Industry for formal determination. A transcript and revision of the grass distribution lists have been started, bringing the synonymy up-to-date as far as possible. Much time has been spent in "catching up loose ends," such as check-identifications, conferences with Mr. Tidestrom as to plants held out from old collections for further study, etc. A redistribution of plants in our very crowded

herbarium was started, based on the acquirement of another case, and about 850 additional plants were filed. We need still another case to avoid serious injury to specimens. "The poison squad" also got into action to quell another uprising of the cigarette beetle (Lasioderma serricorne) which, with its first cousin the drug beetle (Sitodrepa panicea), is Goth and Vandal in raising herbarium havoc. The odors of CS₂, if not of sanctity, are now pervading our corridors. 205 plants were mounted during the month and numerous new genus folders added.

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JORNADA RANGE RESERVE

Range Conditions and Precipitation

The forage as a whole is very good for this time of the year. The bunchgrasses, our species of the genera Bouteloua, Aristida and Sporobolus, have produced a better than average forage crop. The Tobosa grass (Hilaria mutica) and the Burro grass (Scleropogon brevifolius) did not do so well. In many instances these grasses produced very little new growth over large areas which they occupied in both pure and mixed stands. Since the bunchgrasses represent our winter and spring forage and the Tobosa and Burro grass are palatable only in the summer and early fall the winter carrying capacity of the range is not materially affected by a relatively poor crop of grasses which are palatable only during the growing season.

Rather heavy rains which have come during the past six weeks have caused a general greening up of the grasses and many winter weeds are making their appearance on the range.

The seasonal precipitation (July, August and September) for this year averaged 4.36 inches for the eighteen stations on the Reserve. This figure is 0.34 inches lower than the average of 4.70 inches for the region.

The rainfall for the month of November will average approximately 1.50 inches as compared to 0.09 inches for November 1926 and a trace for the same month in 1927.

Condition of Stock

All stock are in excellent condition on the Jornada. Ample feed is assured for the winter. No loss from disease has occurred and none is anticipated. The loss from lightning is unusually low, a total of two cows to date.

One hundred fat cows are being shipped today (November 24) which represent the first shipment of cull cows for the season.

The Jornada herd is to be increased by one thousand head of cows with calves which were recently purchased in a region of short feed at approximately the same price for cow and calf as is received for the cull fat cows sold from the Jornada herd.

The first shipment of two hundred of the new cows and calves arrived on the 21st. Two subsequent consignments of 400 head each are expected to arrive within the next four weeks.

Investigative Work

All field work except the reconnaissance is completed for the year and the annual report is well under way. Compilation of data is being carried forward and Ranger Wang of the Vallecitos district of the Carson National Forest is assisting with the reconnaissance.

Visitors

Mr. and Mrs. E. R. Ware of Colorado Springs, Colorado, were visitors at the Jornada November 11 and 12. Mr. Ware is located on the Livermore ranger district on the Colorado National Forest.

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SANTA RITA

Natural Revegetation

With a summer rainfall 30 per cent below the past 27 years' average, growth has been good and the forage crop appears to be about 70 per cent of normal, considering the extremely dry period from March to June inclusive when only 24 per cent of normal rainfall was recorded.

the growth is very much better than might have been expected. Field observations indicate that there has been some loss in density of the most important perennial grasses, and while this may run as high as 40 per cent in local areas it will not generally average above 15 to 20 per cent.

The last half of October and the early part of November was spent in charting Quadrats on the Reserve. Mr. Lyle Young, a student in the range management course at the University of Arizona, was secured to assist in the work and proved exceptionally good in operating the chartograph. Mr. McGinnies aided throughout the period in charting and note collecting and also collected field data on some of his own projects which are being conducted at the Reserve.

Handling Stock

During October and November roundups were held in all the pastures on the reserve and accurate counts made of all stock. At this time all the cattle to be sold were cut out and shipped from Amado early in November. Calves brought \$59.00 per head, yearlings \$49.00 and two-year old steers \$59.00. Almost three carloads of dry cows, sold by weight, averaged 890 pounds and brought \$75.00 per head. Well over 500 head of cattle were removed from the reserve by fall sales, and approximately 100 fat cows still remain to be sold in the near future.

Water Development

The deficiency in spring and summer precipitation has made it necessary for Parker to deepen five of his main wells and in each one he succeeded in greatly increasing the flow of water so that he should be in a position to meet future dry spells without trouble. Parker plans on putting up a windmill at the Old Benson ranch and another at his Amado well in the near future. Later on he will likely put one on his Lower Sawmill well.

Ruelas recently installed a 6,000 gallon storage tank in Pasture 15 and connected it up with his Helvetia pipe line. The entire pasture has been almost totally protected since it was fenced in 1926 and will furnish a good supply of forage to carry cattle through the balance of this grazing year.

Miscellaneous

Mr. Chapline spent the period from October 2 to 19th inclusive going over the work at the reserve and in discussing with each coop-

erator the essentials of the new agreements which are to go into effect on July 1, 1929. During his stay a trip was made over the reserve with Dr. H. L. Shantz, President of the University of Arizona, and others interested in the work.

Effective November 21, Elizabeth Palmer of Tucson, was appointed as computing clerk in the Tucson office of the range reserve.

On November 23 Messrs. Calkins and Randles made a trip out to the reserve and spent the day going over the various projects. This was Mr. Randles' first trip to the reserve and we did our best to show him what our Arizona Desert Ranges will produce under proper methods of management.

Mr. Eldrid Wilson, Geologist from the Bureau of Mines, spent November 24 at reserve headquarters looking into the water situation and advising us on our prospects for water. A location for the new well has been made and work already started. To date the prediction is similar to the recent Presidential election and we'd rather wait until it is over before saying whether we do or do not get water.

Mr. Turner spent November 7 to 15 on his vacation and visited among other places Roosevelt dam and Phoenix where he attended the Arizona State Fair. His new Erskine went the entire route under its own power, at least that's the story he tells, and we have no proof to the contrary.

The director spent from November 7 to 10 with Supervisor Winn making an inspection trip over the Tumacacori division of the Coronado. Ranger Wingo certainly need not worry about running out of feed for every allotment visited was in fine condition with an excellent stand of grass. It certainly was a treat to see such range after extensive observations on ranges throughout the southern part of the State made during the last couple of months.

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